

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of

)

WC Docket No. 13-184

)

Modernizing the E-rate Program for  
Schools and Libraries

)

)

)

**Comments of ApplianSys on the proposed Eligible Services List – add caching to category one**

In response to requests for comment on the 2017 Eligible Services List, ApplianSys recommended that FCC:

- make caching available for Category One funding
- refine its measurements of affordability to consider capacity delivered by caches
- modify bid evaluation methodology to help districts avoid bandwidth overspend
- take steps to avoid WiFi and caching competing for the same funding
- further research the cost-performance of the use of caching

ApplianSys accepted the decisions not to implement these changes at that time, but urges FCC to reconsider these in light of clauses in the 2019 proposed Eligible Services List and as it reviews the impact of 2014's E-rate modernization order and determines funding for future years.

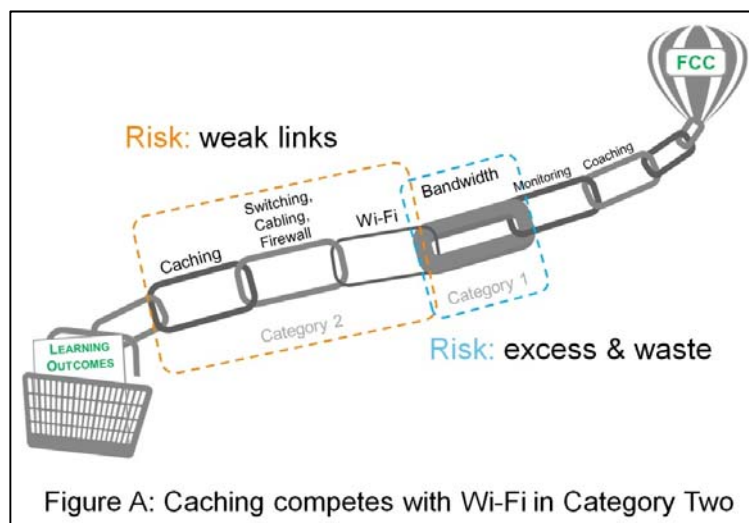
ApplianSys additionally proposes that FCC develops and publishes a more nuanced approach to bandwidth-per-student targets to avoid encouraging wasteful investment in excessive capacity.

**Ensure that E-rate funds 'effective capacity' and reduce category one waste**

**A fundamental issue is that the current approach to funding E-Rate** — whereby broadband as Category One enjoys unlimited and priority funding whereas the technologies and services to make broadband available inside classrooms are separated out as Category Two and capped at a \$150 per student budget — **is dangerously at odds with the stated intent of the 2014 Modernization Order to provide a 'whole network' approach to connecting schools and students.**

In reality, the e-learning network needed for modern internet-enabled independent learning is an interdependent ecosystem as illustrated in Figure A. There's no value in pumping up one link in the school's technology chain disproportionately to the other. Everything needs to be in balance and failing that, the weakest link will define the limits of the networks capabilities.

Bandwidth is in effect pumped up disproportionately in the FCC model today. Unlimited funding under Category One pushes schools to rely solely on bandwidth upgrades - neither a cost effective nor prudent use of E-Rate funds.



ApplianSys first comment on the Eligible Services List 2019<sup>1</sup> presented data from the 2018/19 E-rate cycle showing that \$130m more on bandwidth than would be required if caching were deployed at all school districts.

Most pertinent to this discussion is the fact that **the current Category Two funding cap of \$150 per student every 5 years is forcing schools to choose between funding either caching or Wi-Fi and often not be able to do both.**

**However, both caching and Wi-Fi are essential to delivering speedy access to digital learning** given the unique demands facing schools.

- Today, a typical school's web traffic spans HTTPS content and video, to modern content delivery networks (CDN), to learning management systems (LMS) and login-protected content - to bandwidth-intensive software updates that increase in size every year.
- Not all traffic is equal and objects arrive at the edge of the K-12 network at a variety of different speeds, many of them sub-optimal in terms of browser responsiveness to support e-learning and timed assessments.

ApplianSys **endorses the need for robust Wi-Fi**. Without it, LAN speeds generated by caching are throttled by the Wi-Fi infrastructure and the potential for fast responsive browser performance is thwarted.

With an appropriate combination of caching and Wi-Fi, that 'whole network' approach can properly be supported:

- Large video files and software updates, that normally swamp a school's Internet connection when multiple devices access them concurrently, can be downloaded just once and then served from memory for all subsequent requests.
- While removing this extremely bandwidth-heavy traffic from the upstream Internet connection and/or WAN link, caching **also** delivers that data at LAN speeds, meaning that – instead of clogging up the Wi-Fi for hours – they clear the LAN in seconds. **IF** – the Wi-Fi is suitable provisioned.

**Adequate Wi-Fi infrastructure is a key component of the modern network that enables rich digital learning that transforms education.** There has certainly been laudable progress in providing on-campus Wi-Fi access as a direct result of E-Rate funding.

The FCC recognized in 2014 that its \$150 estimate was at the lower end of the range produced by the models of internal connections deployments. And they are notable for their singular focus on Wi-Fi. We'd say that this effort fell short by not reflecting the reality of the combined and complimentary internal connections technologies needed to deliver connectivity and speedier access in the classroom. Today, by having Wi-Fi and caching compete in the same limited funding pool, we risk under-resourcing one of them when both need to be strong links in the proverbial chain.

**We contend that schools should have to choose between bandwidth and caching – not between Wi-Fi and caching.**

**We urge the FCC to consider 'competition' between bandwidth and caching as a thoroughly constructive approach to eliminating wasteful E-Rate spend on excessive bandwidth and potentially freeing up additional funds for Category Two spend:**

- The focus in Category One should be on helping a school get the best possible value from its bandwidth investment before addressing any need to increase bandwidth capacity in due course. Today, Broadband spend is uncontested, where it should be in competition – driving a like for like comparison – with caching:
  - Category One could be extended to include caching so that Broadband and its substitute (caching) compete on an equal footing
  - If Category One should remain 'Broadband-only', then Category 2 should be suitably provisioned so that Caching (and Wi-Fi) can both be adequately resourced as a suitably funded (and therefore no less attractive) alternative to Broadband

---

<sup>1</sup> See ApplianSys comment, *Proceeding: 13-184, Filing 10902329413854, November 2018*

With regards to “On-premises equipment that connects to a Category Two-eligible LAN is eligible for Category One support if it is necessary to make a Category One broadband service functional”, add language to clarify that this includes when it compensates for inadequate external link bandwidth capacity, or offers the same end result as increasing the capacity of the external link.

On this basis, we believe that dedicated caching appliances like **CACHEBOX** should be eligible for Category One funding.

Respectfully submitted,

ApplianSys LLC

By: Roger Clark

ApplianSys Head of Education Technologies

5323 Levander Loop,

Austin, TX 78702

roger.clark@appliansys.com

3 September 2019